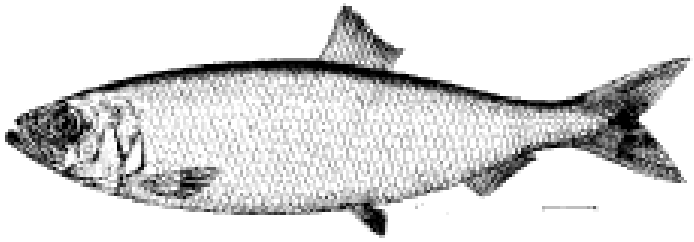

Last revised: January 2000

Summary Status

Landings and Abundance Trends

Landings Data

PDF Version

Atlantic Herring

by
William Overholtz

The Atlantic herring, *Clupea harengus*, is widely distributed in continental shelf waters from Labrador to Cape Hatteras. Important commercial fisheries for juvenile herring (ages 1 to 3) have existed since the last century along the coasts of Maine and New Brunswick. Development of large-scale fisheries for adult herring is comparatively recent, primarily occurring in the western Gulf of Maine, on Georges Bank, and on the Scotian Shelf. Gulf of Maine herring migrate from summer feeding grounds along the Maine coast to southern New England and Mid-Atlantic areas during winter, with larger individuals tending to migrate further distances. Tagging experiments have also provided evidence of intermixing of Gulf of Maine-Scotian Shelf herring during different phases of the annual migration.

Spawning in the Gulf of Maine occurs during late August-October, beginning in northern locations and progressing southward. Atlantic herring are not fully mature until age 4. Age at maturity varies annually and appears to change in response to density dependent effects. Herring eggs are demersal and are typically deposited on gravel substrates. Primary spawning locations off the northeastern United States are located on the Maine coast, Jeffreys Ledge, Nantucket Shoals, and Georges Bank. Incubation is temperature dependent, but usually occurs within 7 to 10 days. Larvae metamorphose by late spring into juvenile brit herring that may form large aggregations in coastal waters during summer. By age 2, juvenile herring are fully vulnerable to coastal fisheries using both fixed and mobile gear.

In the past, the herring resource along the East Coast of the United States was divided into the Gulf of Maine and Georges Bank stocks. There is genetic and tagging evidence that both support and refute this stock division. Of greater concern to those managing the resource is the fact that fishery-independent measures of abundance for herring include contributions of fish originating from both spawning areas. As a consequence, herring from the Gulf of Maine and Georges Bank have been combined for assessment purposes into a single coastal stock complex. This approach has many advantages over the separate stock approach, but also poses a number of technical and management challenges.

Total landings for the coastal stock complex have changed substantially since the 1960s when distant water and domestic fleets landed 101,000 mt in 1961; with landings reaching a peak of 470,000 mt in 1968. Landings declined steadily from 393,000 mt in 1969 to 77,000 mt in 1977 after the large offshore fishery collapsed. The fishery was focused on near shore waters of the Gulf of Maine during 1978-1989 with landings fluctuating between 36,000 mt to 104,000 mt. Landings during 1990-1998 ranged from 81,000 mt to 124,000 mt and were taken by the United States and Canada. Recreational landings have been negligible.

Changes in commercial landings trends are best understood by examining changes in regional fisheries that exploit the stock complex. The fishery in the Gulf of Maine consists of fixed and mobile gear fisheries in coastal waters. Landings from the New Brunswick weir fishery ranged from 9,000 to over 44,000 mt during 1980-1998, while the mobile gear (purse seine and mid-water trawl) fisheries landed between 27,000-81,000 mt during the same period. There has been a great deal of annual variability in the landings, but there is little evidence of any long-term trend. However, there have been changes in the distribution of landings between the two principal gear types: mobile and fixed gear. Over the past five years, more than 90 percent of Maine herring landings were taken by mobile gear from the United States, compared with less than 50 percent during the 1970s. This shift appears to be related to reduced availability of herring to the fixed-gear fisheries and also less emphasis on this type of fishing. In addition, mobile gear landings include increasing catches made by mid-water trawlers. Due to recent declines in export markets for adult herring, a significant proportion of the catch has not been used for human consumption.

The herring fishery on Georges Bank was initiated in 1961 by distant-water fleets. Landings in this fishery peaked in 1968 at 373,600 mt and subsequently declined to only 43,500 mt in 1976 as the fishery collapsed. There has been a limited directed fishery for Atlantic herring by US vessels since 1994 on Georges Bank.

Estimates of stock biomass (all ages) for the coastal stock complex were in excess of 1 million mt before the collapse associated with the Georges Bank fishery. After the collapse, stock size estimates declined to less than 100,000 mt. In the early 1980s, fishing by distant-water fleets ended and the stock complex began to rebuild. Stock biomass has increased significantly in recent years, primarily due to increased spawning, first on Nantucket Shoals and later on Georges Bank. The offshore spawning component, which represents the largest historic component of the stock complex, appears to have recovered from its collapse during the early 1970s. Fishing mortality has remained low for over a decade and was estimated at F=0.05 in 1997. Stock biomass is expected to remain high in the near future, as recent recruitment appears to have been strong. The stock is not overfished and overfishing is not occurring.

An Interstate Fishery Management Plan has been adopted by the Atlantic States Marine Fisheries Commission (ASMFC), and a Fishery Management Plan has been developed by the New England Fishery Management Council (NEFMC) in coordination with the ASMFC. This plan was partially approved in 1999. Management measures now in place include spawning area closures, an area management scheme (three areas), catch controls on the entire complex, and a TAC (60,000 mt) on the near shore Gulf of Maine fishery.

For further information

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NEFSC [Northeast Fisheries Scinece Center]. 1998. [Report of the] 27th Northeast Regional Stock Assessment Workshop (27th SAW) Stock Assessment Review Committee (SARC) consensus summary of assessments. Northeast Fish. Sci. Cent. Ref. Doc. 98-15. 350 p.

Summary Status

Long-term potential catch (MSY)	=	317,000 mt [1]
Biomass corresponding to MSY	=	B_{MSY} = 1.07 million mt [1]
Minimum biomass threshold	=	1/4 B_{MSY} = 267,000 mt
Total biomass in 1997	=	2.9 million mt (Implies stock was not overfished)
Spawning stock biomass in 1997	=	1.8 million mt
F_{MSY} [2]	=	0.30
F_{TARGET} [2]	=	0.28
Overfishing definition	=	$F_{THRESHOLD97}$ [2, 3] = 0.30
F_{1997}	=	0.05 (Implies overfishing was not occurring)
Age at 50% maturity	=	2.9 years, males
	=	3.0 years, females
Size at 50% maturity	=	25.3 cm (10.0 in.), males
	=	25.4 cm (10.0 in.), females
Assessment level	=	Age structured, VPA
Management	=	Sea Herring FMP (ASMFC)

M = 0.20 **$F_{0.1}$ = 0.20** **F_{MAX} = 0.40** **F_{1997} = 0.05** [4]

[1] Based on yield and biomass per recruit modeling SARC-27 considered that MSY should not be considered to be above 200,000 mt and 1.5 million mt respectively until recent recruitment was better estimated.

[2] On biomass

[3] $F_{THRESHOLD}$ = F_{MSY} = 0.30 when biomass = B_{MSY}. When biomass is between B_{MSY} and ½ B_{MSY} $F_{THRESHOLD}$ is the maximum F that allows for rebuilding in 10 years and when biomass is between ½ B_{MSY} and 1/4 B_{MSY} $F_{THRESHOLD}$ is the maximum F that allows for rebuilding in 5 years. When stock biomass is below 1/4 B_{MSY} F should be reduced to as close to zero as practicable.

4 Fully recruited F

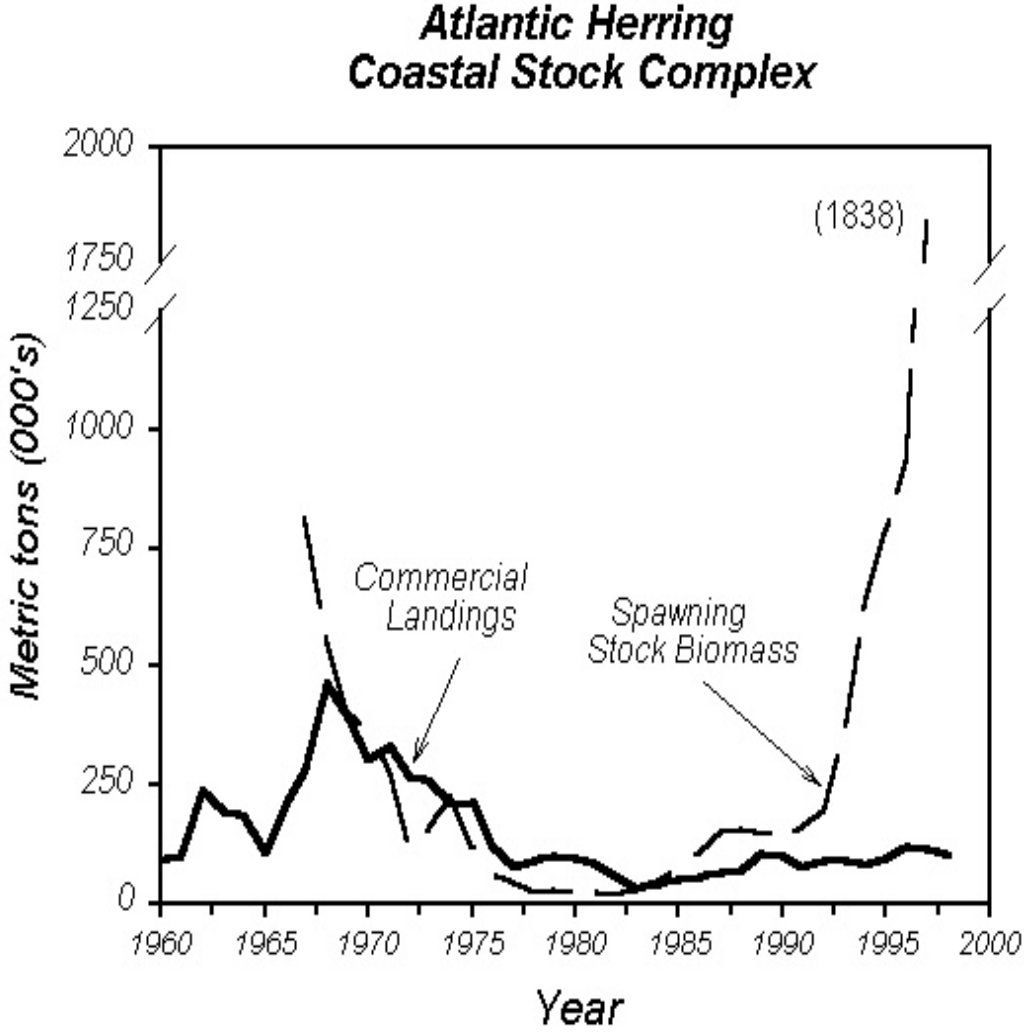
Atlantic Herring
Coastal Stock Complex
2000
1750
1250
1000
750
500
250
0
(1838)
Metric tons (000's)
Commercial
Landings
Spawning
Stock Biomass
1960
1965
1970
1975
1980
1985
1990
1995
2000
Year

Table 21.1 Recreational and commercial landings (thousand metric tons)

	Year										
Category	**1979-88 average**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
U.S. recreational	-	-	-	-	-	-	-	-	-	-	-
Commercial											
United States	46.4	65.2	64.6	56.7	62.3	62.8	60.8	78.5	108.2	97.4	81.6
Canada	23.5	44.1	38.8	24.6	32.0	31.6	22.2	18.2	15.9	20.6	20.1
Other	<1.0	-	-	-	-	-	-	-	-	-	-
Total nominal catch[1]	70.9	109.3	103.4	81.2	94.2	94.3	83.0	96.8	124.1	118.0	101.7

[1]Age groups 1 and older